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MINISTRY OF SUPPLY

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

BOSCOMBE DOWN

PEMBROKE C. MK. 1 WV. 699

RADIO ACCEPTANCE TRIALS

10/51 (A1068) Wt.8856/1527. 32M. 2. 5/52. H. E. & S. Gp.848

Unclassified

8th Part of Report No. AAEE/896

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

23 FEB 1954

Pembroke C.Mk.1 WV.699

Radio Acceptance Trials

A. & A.E.E. Ref.: AAEE/411/69/Radio
M. O. S. Ref.: 48th Joint Radio Meeting M.O.S. - A. & A.E.E.
Period of Trials: 23rd September, 1953 to 3rd December, 1953.

Progress of issue of Report

Report No.		Title	
3rd Part of AAEE/896		WV.698	Brief Handling Trials at a Forward C.G. Position.
4th	- do -	WV.698	Single Engine Climb Performance.
5th	- do -	WV.698	A.S.I. and Altimeter Pressure Error Corrections.
6th	- do -	WV.698	Partial Engineering Assessment.
7th	- do -	WV.701	Cockpit Appraisal and Night Flying Illumination Assessment.

Summary

Radio Acceptance Trials were carried out on Pembroke C. Mk.1 WV.699 prior to C.A. release.

The performance of the installations was satisfactory and their layout for maintenance purposes was acceptable.

An undesirable feature in this aircraft was the inability of the pilot to use the V.H.F. facilities unless the operator's station box was switched to "V.H.F." or "i/c", and attention should be paid to other undesirable features detailed under para. 13.

This Report is issued with the authority of

Air Commodore,
Commanding, A. & A.E.E.

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/Introduction.....

1. Introduction

1.1. Trials were required on Pembroke C. Mk.1 aircraft equipped with:-

A.R.I. 5490	T.R.1934/35
-	A.D. 97/108
(A.R.I. 5428	Radio Compass
(	or
(A.R.I. 5816	Gee Mk.3. Alternative fit.
A.R.I. 5610	Rebecca Mk.4.
A.R.I. 5284	A.Y.F.

1.2. All trials were carried out on Pembroke C. Mk.1 WV.699 in accordance with trials pro-forma, 41st Joint Meeting, Ministry of Supply, Air Ministry, A. & A.E.E. dated 13th February 1952.

1.3. To assess the performance of the above installations a total of 12 sorties were made, totalling 20 flying hours.

2. Object of trials

2.1. To test the Pembroke C. Mk.1 radio installations prior to C.A. clearance being given.

2.2. To make recommendations for modification, either to the installation or equipments as considered necessary.

3. Reports issued

3.1. Reports issued:- Nil.

3.2. Included in this report:- A.R.I. 5490, A.R.I. 5428, A.R.I. 5816 A.R.I. 5610, A.R.I. 5284, A.D.97/108

3.3. Reports to follow:- Nil.

4. A.R.I. 5490 (T.R. 1934/35)

4.1. Installation details

4.1.1. The T.R. 1934 and T.R. 1935 were mounted on a shelf in the starboard radio compartment (Fig. 1). This position was satisfactory for maintenance.

4.1.2. The control unit type 382 was mounted on the cabin roof, (Fig. 2) adjacent to the radio compass control unit. This position was satisfactory for maintenance and operation.

4.1.3. The aerial type 228 was situated on top of the fuselage, offset to port of the centre line of the aircraft (Fig. 3). The aerial Type 229 was situated on the top of the fuselage, offset to starboard of the centre line of the aircraft (Fig. 3), both positions were satisfactory.

4.1.4. 'Press to transmit' facilities were available, at the pilots position by means of a switch on the control column, and also at the observers position by means of the morse key type F, when the observers station box was switched to the necessary position.

4.1.5. The control of the V.H.F. facilities was vested in the operators station box Type 931D. This method was not satisfactory. The control of the V.H.F. facilities should be available to both positions independent of the facilities selected at the other station box. If this is not possible, the control of the V.H.F. should be by the pilot's station box Type 932D.

/4.2.....

4.2. Procedure for trials

4.2.1. Polar diagrams. The aircraft was flown on courses at intervals of 10° through 360° over a pre-determined pinpoint, 20 nautical miles from base, at an altitude of 2,000 ft. Measurements were made as the aircraft passed over the centre of the pinpoint, flying straight and level, with its transmitter radiating.

4.2.2. Range runs. The aircraft was flown on a steady course from base, at an altitude of 4,000 ft., and a pinpoint was obtained when communication was lost on the tail aspect. The aircraft continued on course for a further ten miles and was then turned on to a reciprocal course and a pinpoint obtained when communication was re-established. This procedure was employed for both equipments.

4.3. Results

4.3.1. Polar diagrams. The results of the polar diagram runs are given in Figs. 12 and 13 and are satisfactory.

4.3.2. Range Runs. The ranges obtained on the range tests are as follows:-

T.R. 1934 head aspect 96 nautical miles, tail aspect 94 nautical miles.
T.R. 1935 head aspect 96 nautical miles, tail aspect 92 nautical miles.

4.3.3. Intercommunication. Intercommunication was satisfactory.

5. A.R.I. 5428 - Radio Compass

5.1. Installation Details

5.1.1. The R.1937 was positioned on the bottom shelf of the starboard radio compartment (Fig. 4). This position was satisfactory for maintenance.

5.1.2. Indicator Type 1, was mounted on the starboard side of the instrument panel below the Rebecca Mk.4 Indicator (Fig. 5). This position was satisfactory, but the flush mounting of the indicator was not entirely satisfactory as errors occurred in the sectors 090° and 270° due to parallax. The reading of the indicator would be facilitated if provision had been made for the indicator to be tilted by approximately 20°.

5.1.3. The Indicator Type 2 was mounted on the port side of the instrument panel (Fig. 6). This position was not entirely satisfactory for observation, as the sector 330° to 030° was masked by the instrument light fitting.

5.1.4. Control Unit. The radio compass control unit was mounted on the cockpit roof between the pilots and observers seat (Fig. 2). This position was satisfactory for operation by either pilot or operator, and for maintenance.

5.1.5. The loop aerial was fitted on the centre line of the aircraft (Fig. 3) and was accessible for maintenance.

5.1.6. The sense aerial was mounted on the top of the fuselage, offset to starboard of the centre line (Fig. 3).

5.2. Procedure for trials

5.2.1. To obtain the quadrantal error the aircraft was swung on a compass base and bearings were taken at intervals of 10° through 360° on two radio stations. The quadrantal error was corrected on the loop drive mechanism, and a further ground swing was carried out to determine the residual error. A check air swing was then carried out over a pinpoint with the aircraft flying courses of 10° intervals through 360°.

/5.2.2.....

5.2.2. Range Run. A range run was made with the aircraft flying away from a 40 watt ground beacon, and the range taken when the indicator needle failed to follow as the aircraft course was altered.

5.3. Results

5.3.1. The quadrantal and residual error curves are given in Figs. 14 and 15. The check air swing gave results comparable with the residual loop error swing.

5.3.2. Range Run. The range obtained on the range run was approximately 75 nautical miles.

6. A.D.97/A.D.108

6.1. Installation Details

6.1.1. The transmitter and receiver were mounted in the top section of the port radio compartment, (Fig. 7). The position was satisfactory for maintenance. The tuning of the transmitter could not be carried out with the operator in his seat and the tuning of the receiver was not easily carried out.

6.1.2. The modulator and power unit were mounted in the centre section of the port radio compartment, (Fig. 7).

6.1.3. The morse key Type F was mounted on a bracket on the starboard wall of the cockpit, (Fig. 8). This position was not satisfactory for good operating. The provision of a swivelled bracket which could be brought away from the side of the fuselage for operating, and returned to its stowed position when not required would make a better operating position.

6.1.4. The position of the 19 volt power supply switch on the starboard side of the cockpit (Fig. 8) was such that accidental switching on and off could, and did, occur. A cover or locking device should be fitted to this switch.

6.1.5. The fixed aerial was suspended between a mast behind the cockpit and the tail fin, (Fig. 3). No provision was made for earthing this aerial.

6.2. Procedure for trials

6.2.1. The A.D. 97 was tuned over its frequency range at approximately 0.5 Mc/s intervals, and measurements were made at a distance of 1500 yards from the aircraft using a Marconi Field Strength Measuring Set Type TF.379A. Flight tests were carried out to assess the position for operating and functioning of the equipment.

6.3. Results

6.3.1. The result of the frequency/field strength test is given in Fig. 16.

6.3.2. The performance of the equipment and its layout for maintenance was satisfactory.

6.3.3. Intercommunication was available with this equipment.

7. Station Boxes

7.1. Two station boxes were fitted, Type 931D in the operators position (Fig. 8), and Type 932D in the pilots position, (Fig. 6). The positions of the boxes were satisfactory for operation and maintenance.

/7.2.....

7.2. The wiring of the station boxes requires to be modified to enable the communication services, i.e. V.H.F. and MF/HF, to be used by either crew member irrespective of the position of the switch on the other station box.

8. Rebecca Mk. 4 (A.R.I. 5610)

8.1. Installation details

8.1.1. The transmitter-receiver T.R.3624 was mounted on the centre platform in the starboard console behind the observer's seat (Fig. 10) and was satisfactory for servicing.

8.1.2. The control unit type 526 was mounted on the starboard side of the observer's seat (Fig. 8). This position was unsatisfactory, the unit was too far back for the operator to see the controls and very difficult to operate, an improvement could be made by interchanging the control unit with the observer's station box type 931 d.

8.1.3. Indicator type 208 was fitted in the instrument panel on the starboard side (Fig. 5) in a very difficult position for viewing as the observer's head fouled the windscreen wiper. To overcome this bad feature the Indicator should be moved approximately 3 inches to the left and angled upwards.

8.1.4. The transmitting aerial was mounted under the fuselage, just aft of the nose wheel (Fig. 3) and gave a satisfactory coverage.

8.1.5. No B.A.B.S. facility was provided on this aircraft; therefore no separate receiving aerial was fitted.

8.1.6. The two receiving aerial assemblies were mounted on the underside of the port and starboard wing tips (Fig. 3) and gave a satisfactory performance.

8.2. Procedure for trials

8.2.1. To determine the maximum range, and to check the aerial coverage of the installation, flights were carried out at an altitude of 4,000 feet, using a ground beacon with a transmitter output of 30 watts.

8.2.2. To determine D/F sensitivity a china graph recording was made on the Rebecca C.R.T. showing signal amplitude changes for variations in course in steps of 5° up to 20° off course.

8.3. Results

8.3.1. The maximum range at which a homing on to a 30 watt beacon could be started on the head aspect was 62 nautical miles, when flying at 4,000 feet. On the tail aspect the maximum range was 48 nautical miles. These ranges are considered satisfactory.

8.3.2. The results of the D/F sensitivity tests are shown in F.17 and were considered satisfactory.

9. Gee Mk.3 (A.R.I. 5816)

9.1. Installation details

9.1.1. The indicator Type 726, which was alternative fit to Radio Compass, was fitted in the instrument panel on the starboard side (Fig. 9) and was satisfactory for operation and maintenance.

9.1.2. The Waveform Generator type 72 and Receiver type 3673 were mounted in the lower section of the starboard console behind the observer's seat (Fig. 10) and were alternative fit to the Radio Compass Receiver. Both positions were satisfactory for maintenance.

9.1.3. The standard 3 ft. 7½ ins. whip aerial, which was alternative fit to the Radio Compass sense aerial, was mounted on top of the fuselage (Fig. 3), and was satisfactory for operational coverage.

/9.2....

9.2. Procedure for trials

9.2.1. At various ranges out to 200 miles from the master ground station, fixes were taken and visual checks on accuracy made. Also at a range of 100 miles the aircraft carried out a slow turn through 360°, observing the ground station responses all the time, to determine whether there was any blanking of the aerial by aircraft structure.

9.3. Results

9.3.1. When flying at 10,000 feet good readable signals were obtained up to a range of 200 miles. During the flight a number of fixes were taken, all of which agreed with the visual fix.

9.3.2. When carrying out a slow turn at a range of 100 miles from the ground station, no shielding of the aerial occurred on any aspect of the aircraft relative to the ground station.

9.3.3. When operating in the vicinity of two Gee chains with only a small separation in frequency, considerable breakthrough was experienced.

10. A.Y.F. (A.R.I. 5284)

10.1. Installation details

10.1.1. The transmitter-receiver Type RT/7/APN-1 was mounted on a platform on the starboard side, of the fuselage rear compartment (Fig. 11), and was satisfactory for servicing.

10.1.2. The Indicator was mounted on the pilot's instrument panel (Fig. 6) in such a position that at times viewing was restricted by the control column.

10.1.3. No provision had been made for the Limit Switch or Limit lights in the aircraft tested.

10.1.4. The transmitting and receiving aerials were mounted on the underside of both port and starboard tailplanes (Fig. 3), and were considered satisfactory after performance checks.

10.2. Procedure for trials

10.2.1. With all equipments working and a calibrated low reading barometric altimeter fitted, a series of runs were made at constant speed over the sea, at different heights, readings off both indicators being recorded.

10.3. Results

10.3.1. The results of the flight test were as follows after barometric corrections had been applied:-

Bar. Alt. Readings.	A.Y.F. Readings
50	50
100	110
150	160
200	210
250	255
300	310
350	360
400	410

10.3.2. The above results were considered satisfactory, and there was no interference from other radio equipments.

/11.....

11. Inter equipment Interference

11.1. Normal interference occurred on the Gee Mk. 3 when the A.D.97 was transmitting.

11.2. The Rebecca Mk. 4 was, as is customary, unreadable during periods of V.H.F. transmission.

11.3. Breakthrough of the A.D.97 transmissions to the Radio Compass caused difficulty in tuning to weak signals during the period of the A.D.97 transmissions.

12. Echoing Area Trials.

12.1. These trials will be carried out in conjunction with R.R.E. Malvern, before the aircraft leaves A. & A.E.E.

13. Conclusions

13.1. T.R.1934, 1935

13.1.1. The inability of the pilot to use V.H.F. without the operator's station box being switched to appropriate services is unsatisfactory (Para. 4.1.5. refers).

13.2. A.R.I. 5428 (Radio Compass)

13.2.1. Repositioning of the A.R.I. 5428 Indicator Type 2, to a position beneath the pilots G4B repeater, would prevent the masking of the top section of the indicator under all conditions. Angling of the indicator Type 1, would enable the operator to read the indicator more accurately (Paras. 5.1.2. and 5.1.3. refer).

13.3. A.D.97/A.D.108

13.3.1. The use of a hinged bracket for the morse key Type F in lieu of the present fixed bracket would give a better operating position (para. 6.1.3. refers)

13.3.2. A cover or locking device is required to protect the 19 volt supply switch, for the A.D.97/108, being accidentally switched on or off (Para. 6.1.4. refers).

13.3.3. Provision should be made for earthing the H/F aerial when required. (Para. 6.1.5. refers).

13.4. Rebecca Mk. 4.

13.4.1. The performance of this installation was satisfactory.

13.4.2. The control unit type 526 should be re-positioned to a more accessible position to facilitate operation (para. 8.1.2. refers).

13.4.3. The Indicator Type 208 should be moved 3 inches to the left and angled upwards, to improve the viewing position (Para. 8.1.3. refers).

13.5. Gee Mk. 3

13.5.1. This installation was satisfactory for servicing, performance and layout.

13.6. A.Y.F.

13.6.1. The performance of this installation was up to standard, and quite satisfactory for servicing.

13.6.2. The Indicator would be more satisfactory if positioned higher up on the pilot's instrument panel. (Para. 10.12. refers).

/Circulation List.....

Circulation List

D.L.R.D.A./A.L.10	2 copies 1 for action
A.D.R.D.L.1.	1 copy
T.P.A.3/T.I.B.1c.	75 copies
R.T.O. Percivals	2 copies


T.R. 1934/35

FIG.1.

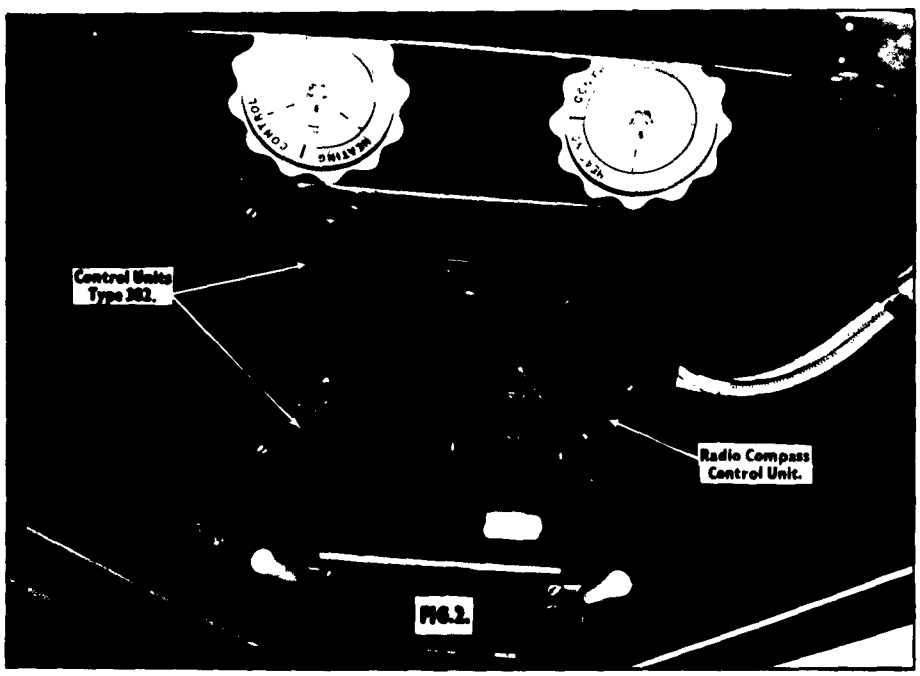

Control Units Type 362.
Radio Compass Control Unit.

FIG.2.

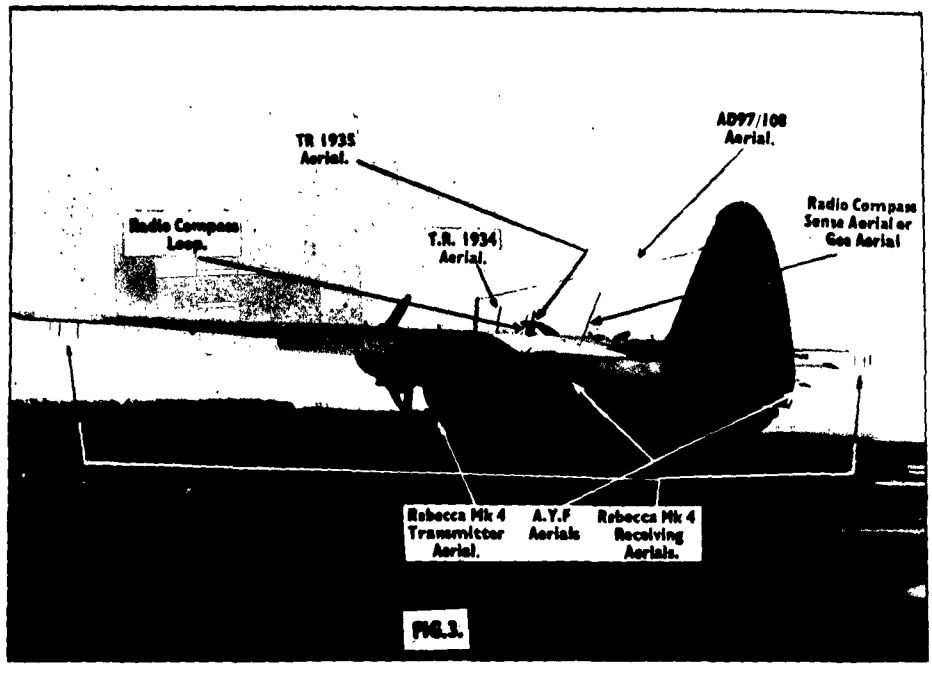

TR 1935
Aerial.
AD97/108
Aerial.
Radio Compass
Loop.
T.R. 1934
Aerial.
Radio Compass
Sense Aerial or
Gee Aerial
Rebecca Mk 4
Transmitter
Aerial.
A.Y.F
Aerials
Rebecca Mk 4
Receiving
Aerials.

FIG.3.

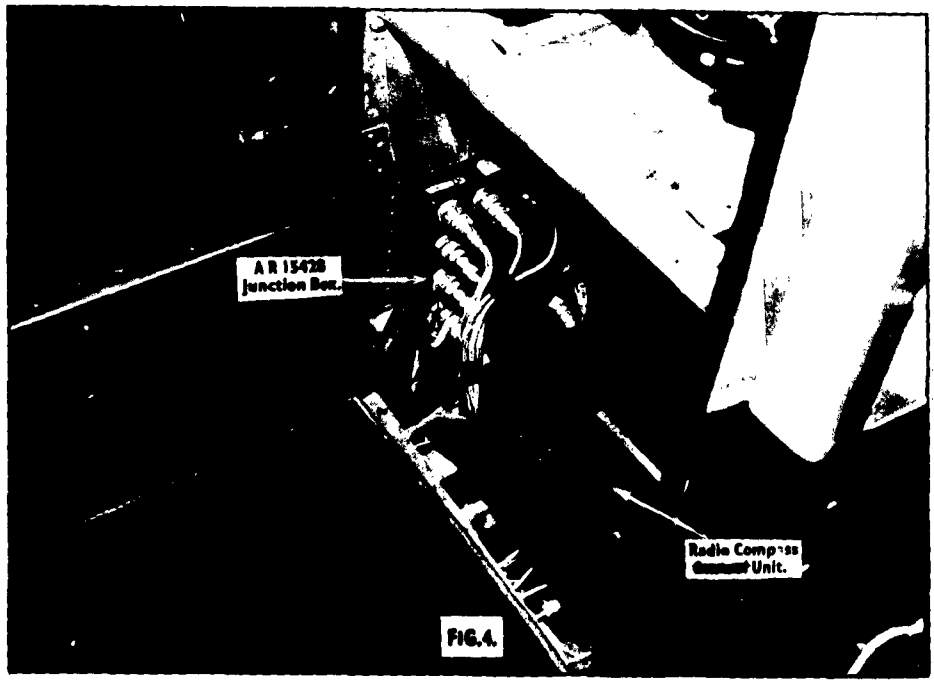

A R 15428
Junction Box.
Radio Compass
Unit.

FIG.4.

FIG.5.

FIG.6.

A. & A.E.E. NEG.No. 14015.

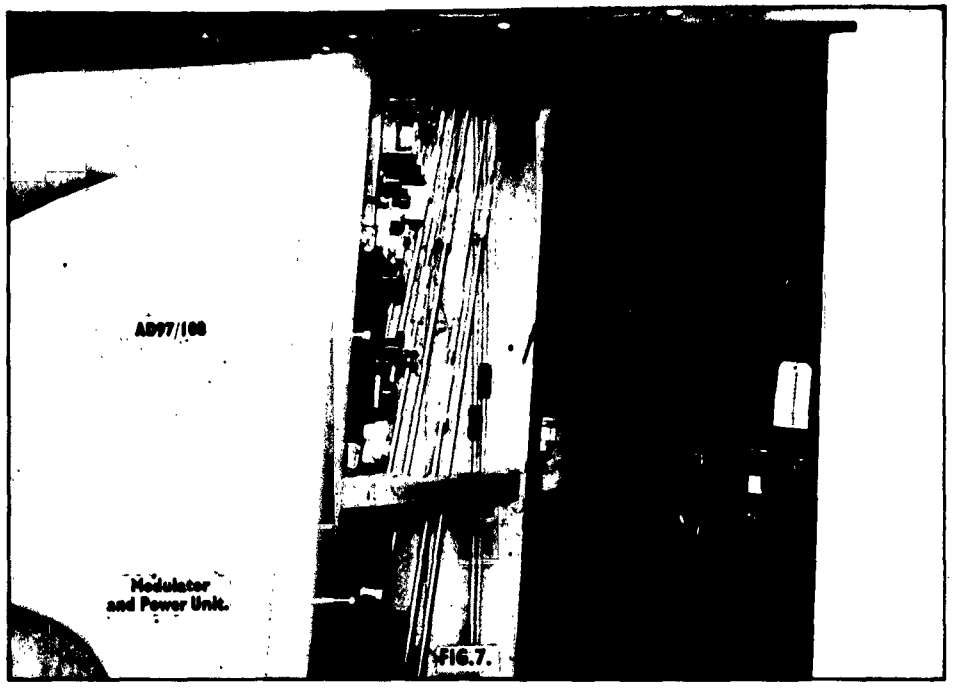


FIG.7.

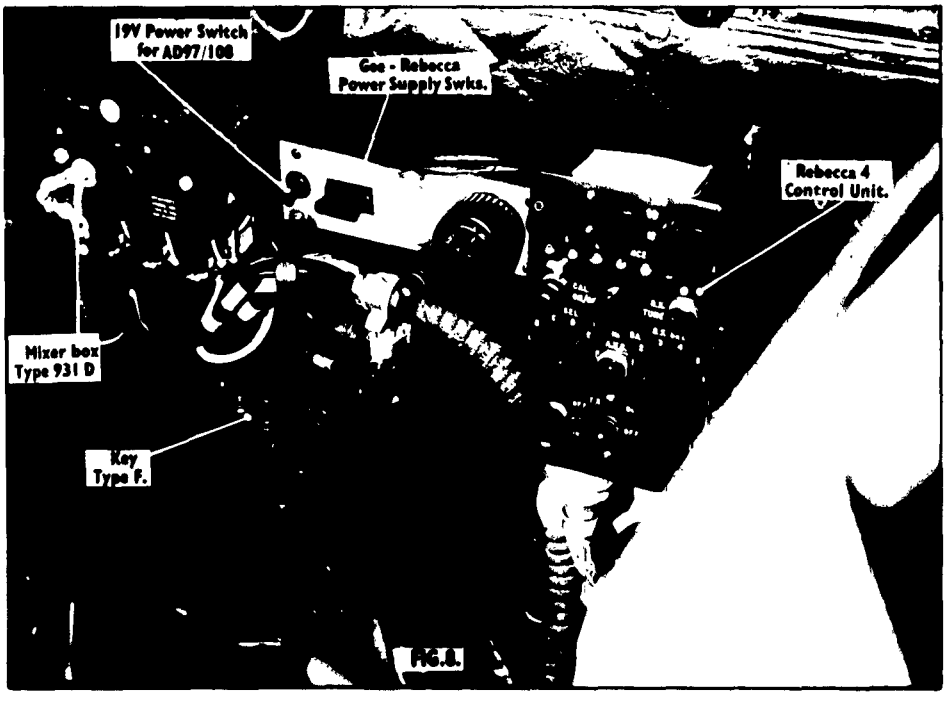


FIG.8.

A. & A.E.E. NEG.No. 16015.

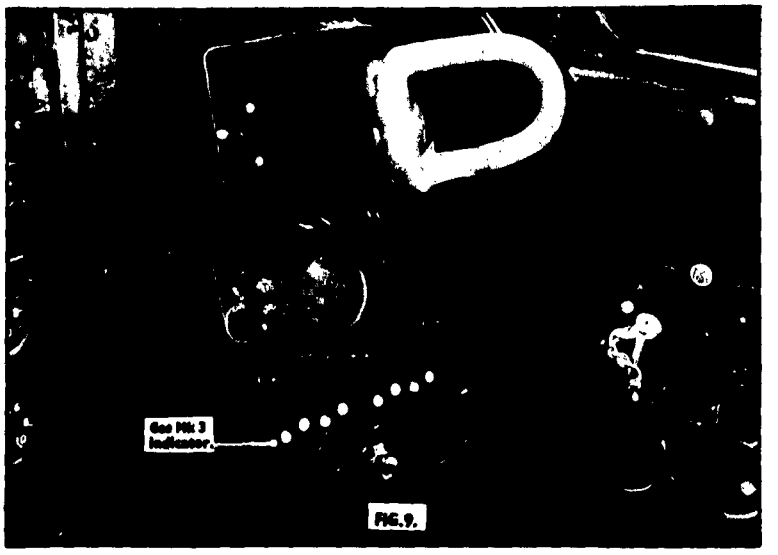


FIG.9.

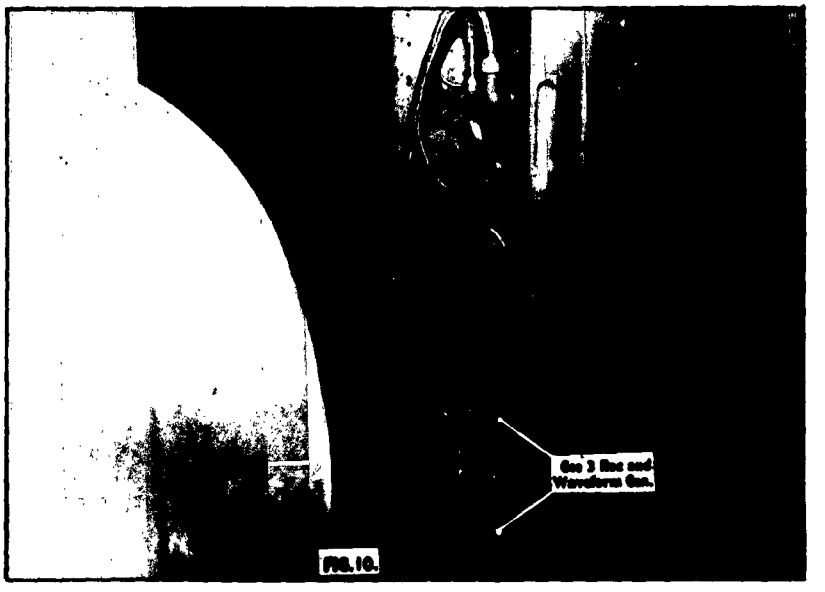


FIG.10.

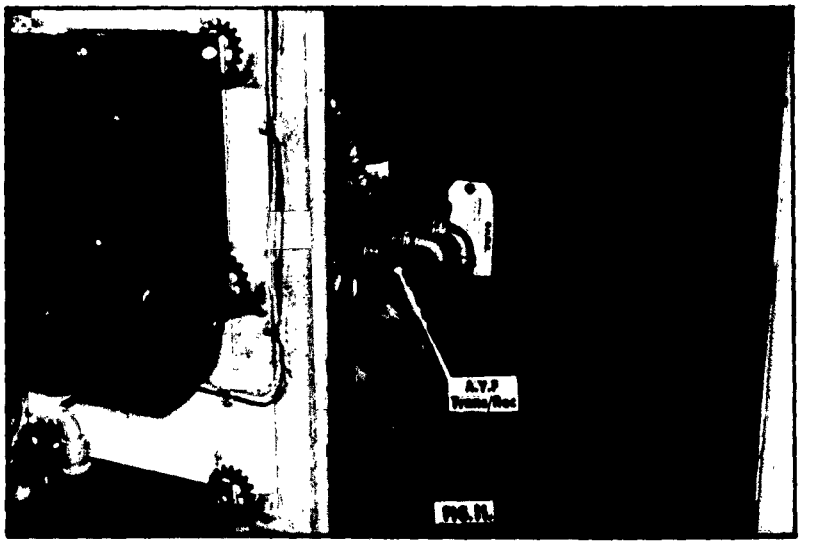
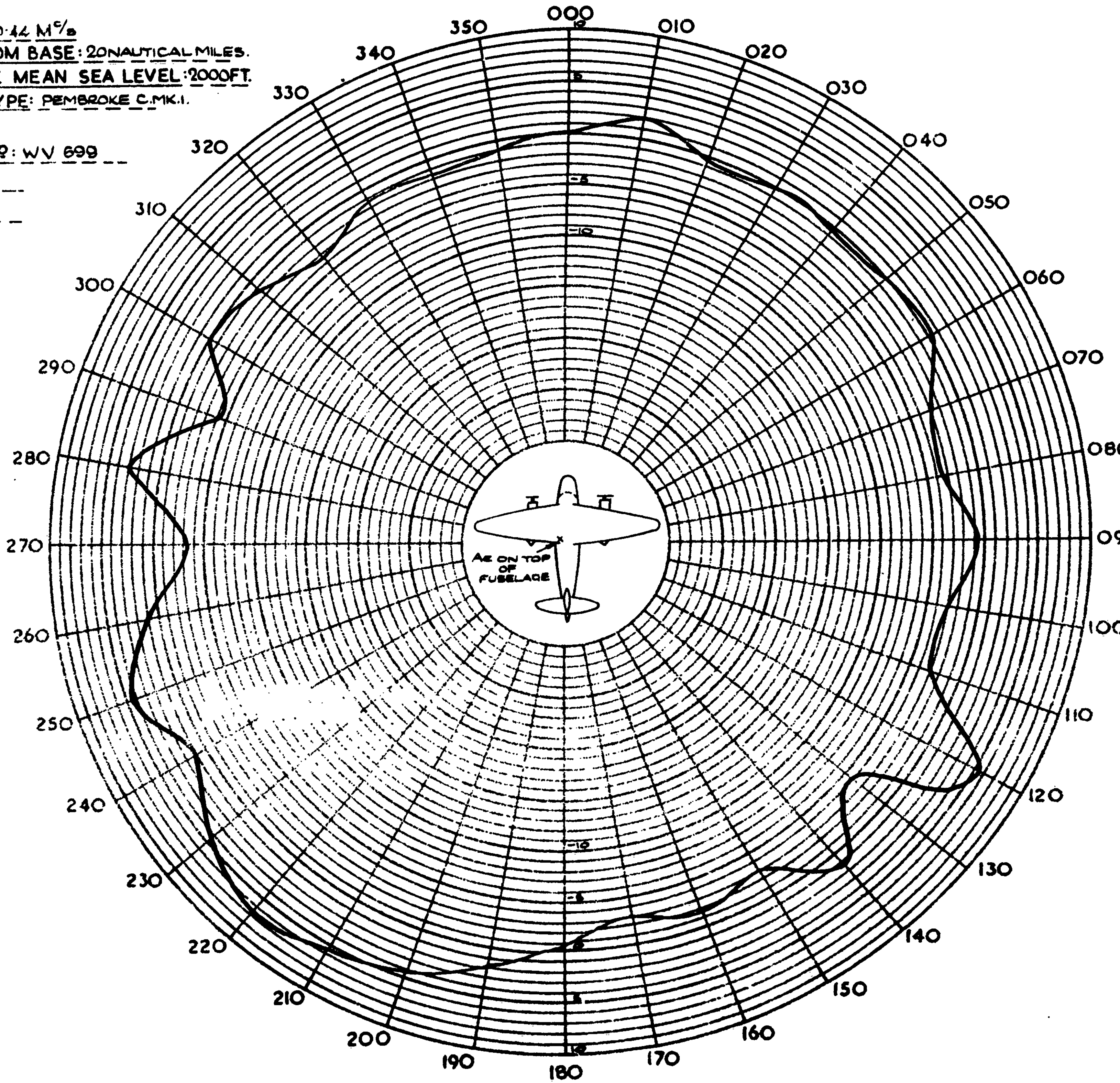


FIG.11.

FIG. 12.

FREQUENCY: 100·44 M c/s
DISTANCE FROM BASE: 20 NAUTICAL MILES.
HEIGHT ABOVE MEAN SEA LEVEL: 2000 FT.
TYPE: PEMBROKE C.MK.I.
AIRCRAFT:
No: WV 699
DATE: 1.10.53
T.R. 1934

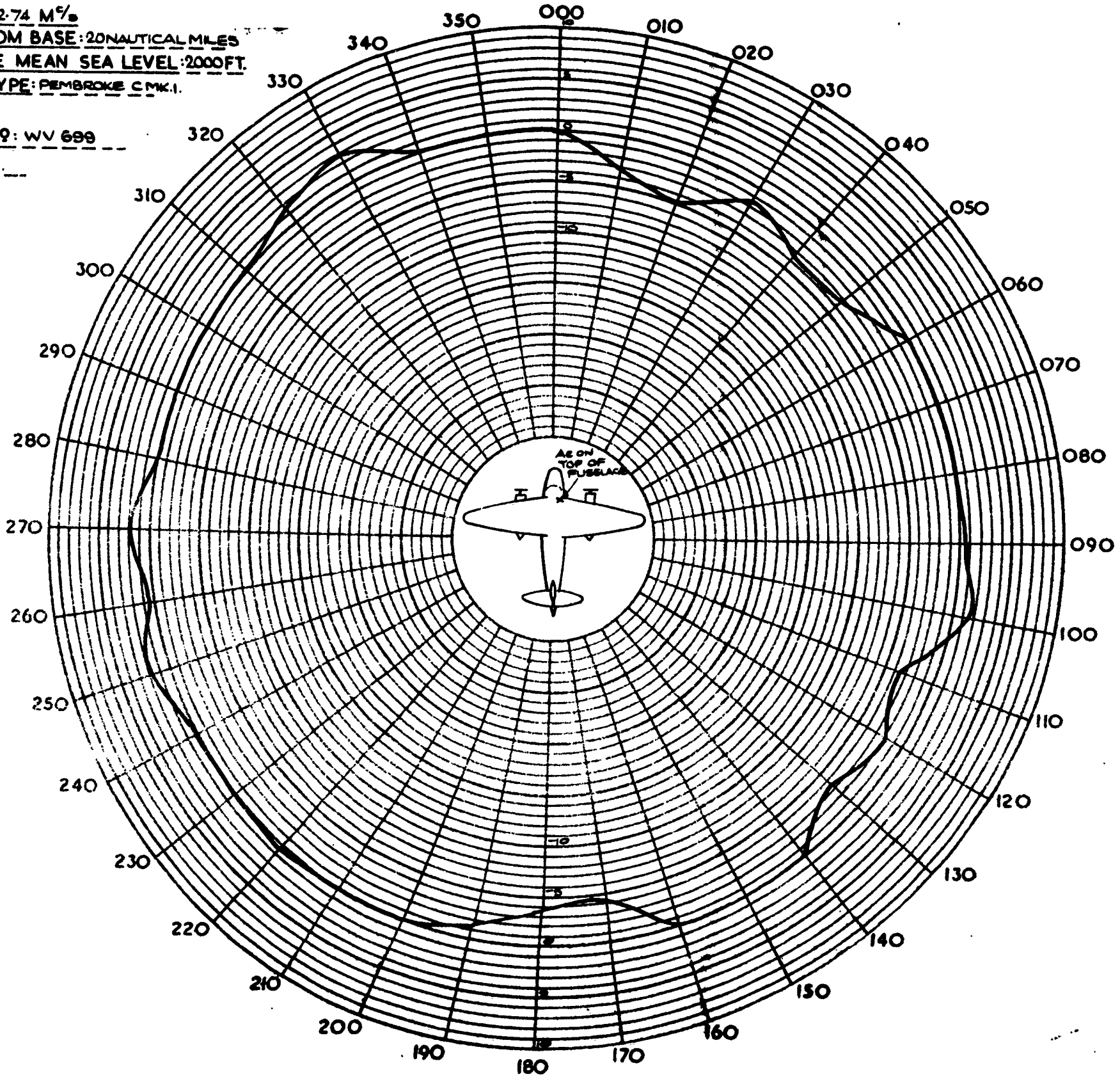


V.H.F. POLAR DIAGRAM
OF
AERIAL SYSTEM TYPE 228

SK.NBA.6193.	18 PART OF REPORT No. A.&A.E.E./886.	PEMBROKE WV 699.	TR. S.M.	CH. J.C. SIMPSON.	APP.	for Sof P	18.1.54.

FIG.13.

FREQUENCY: 142·74 Mc/s
DISTANCE FROM BASE: 20 NAUTICAL MILES
HEIGHT ABOVE MEAN SEA LEVEL: 2000 FT.
TYPE: PEMBROKE C MK.1.
AIRCRAFT:
Nº: WV 699
DATE: 6-10-53.
T.R. 1935

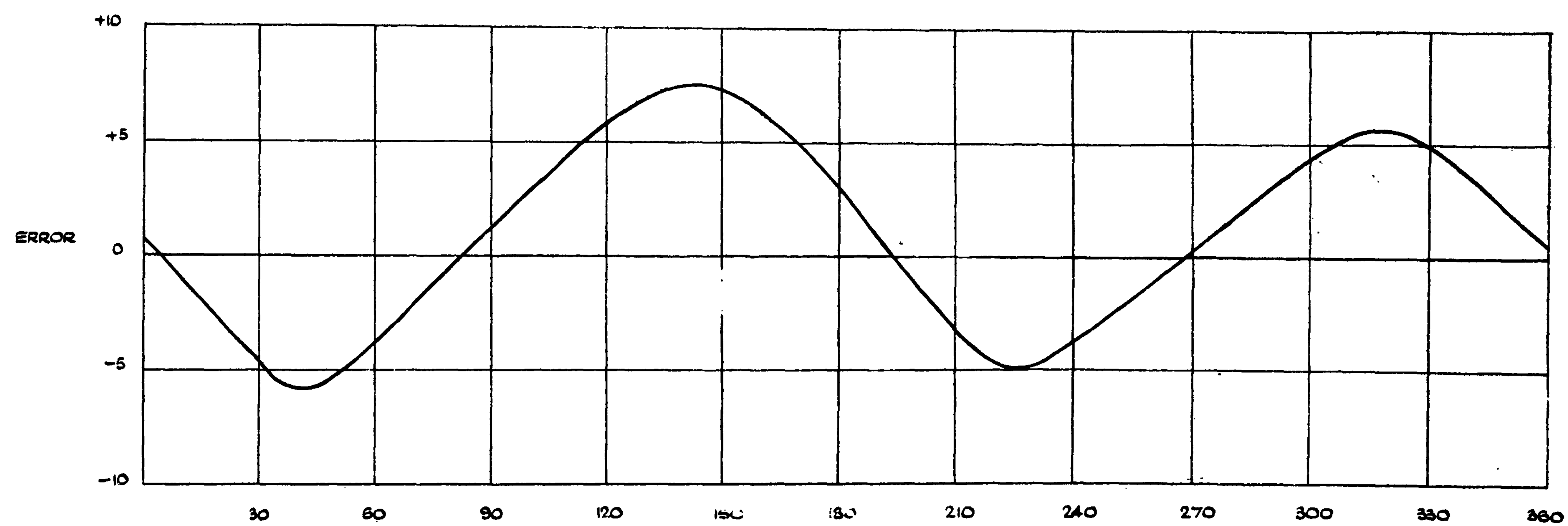


DB's RELATIVE TO HEAD ASPECT.

V.H.F. POLAR DIAGRAM
OF
AERIAL SYSTEM TYPE 229

FIG.14

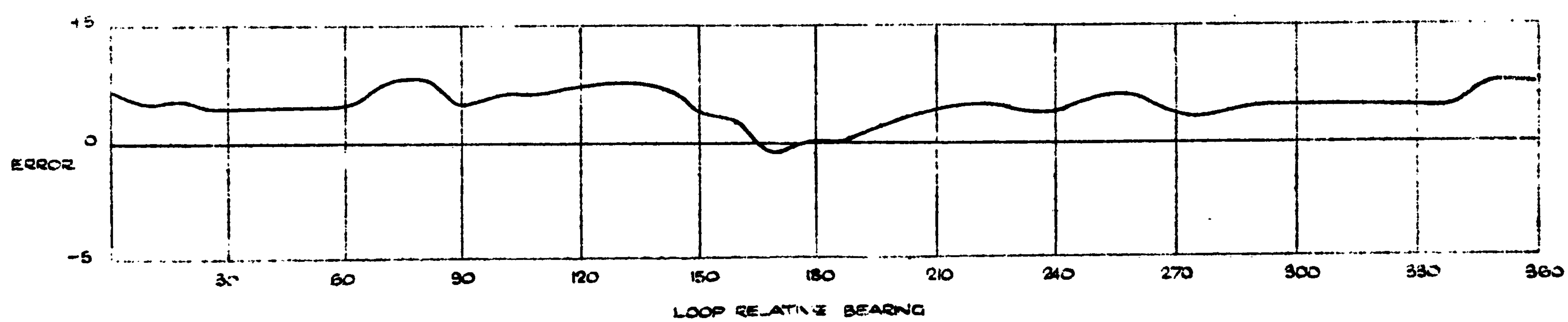
DATE:- 30..10..53.



A.R.I. 5428 QUADRANTAL ERROR CURVE. MEAN OF T
STATIONS. (200 Kc/s AND 1052 Kc/s)

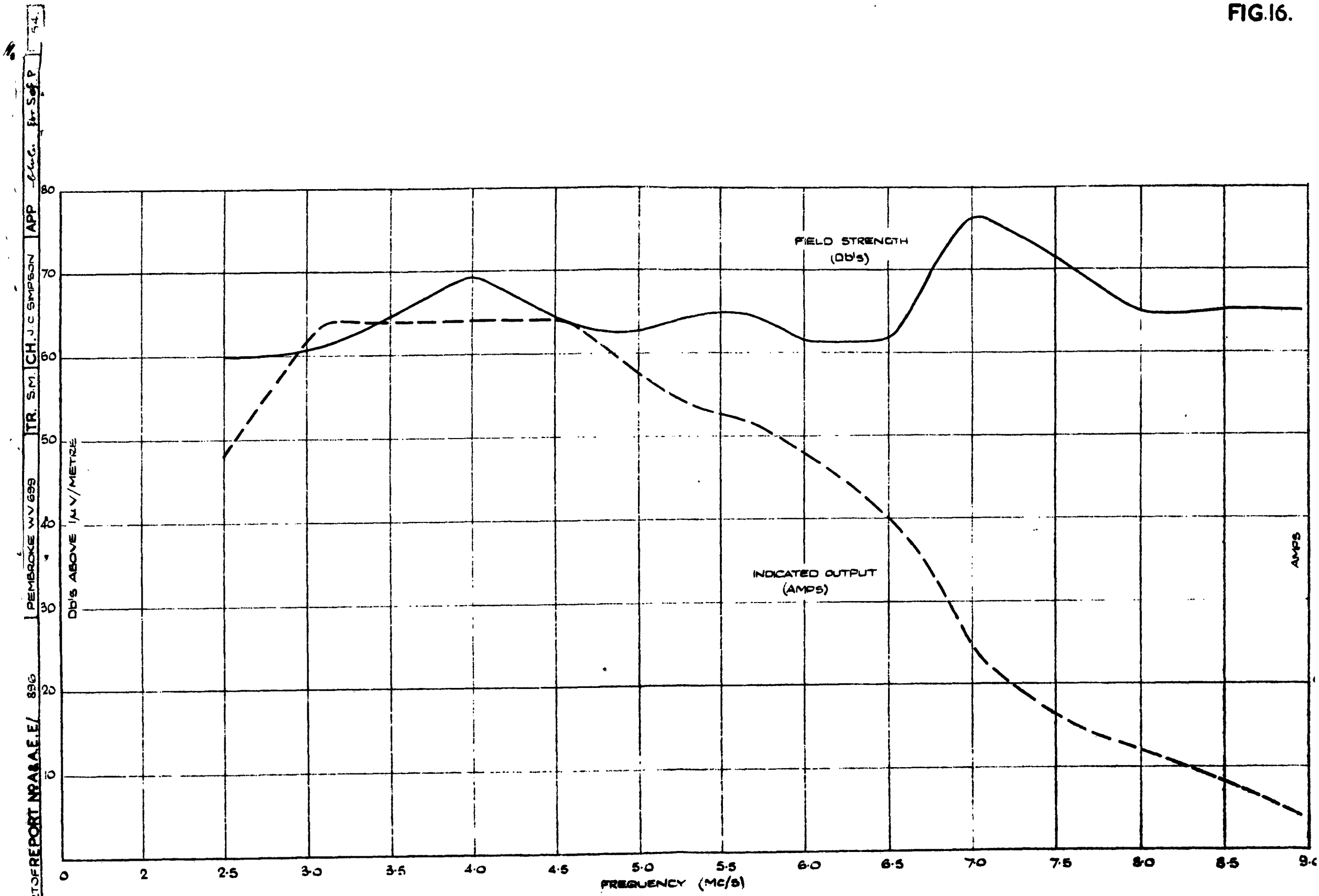
TR. S.M. | CH. J.C. SIMPSON. | APP. | PEMBROKE W.V 699 | 896 | PART OF REPORT No. E/ | 5195.

FIG.15.



A.R.I. 5428 RESIDUAL ERROR CURVE.

FIG.16.



AD 97/108. FREQUENCY - FIELD STRENGTH, (MEASURED AT A DISTANCE OF 1,500 YARDS.)

SK No A.5198.	85 PART OF REPORT No A&A.E.E./896	PEMBROKE dWV 699	TR. S.M	CH. J.C. SIMPSON.	APP. Bwb. for SofP	18.1.54

REBECCA IV TRIALS. D.F. SENSITIVITY.

DATE:- 5.10.53.

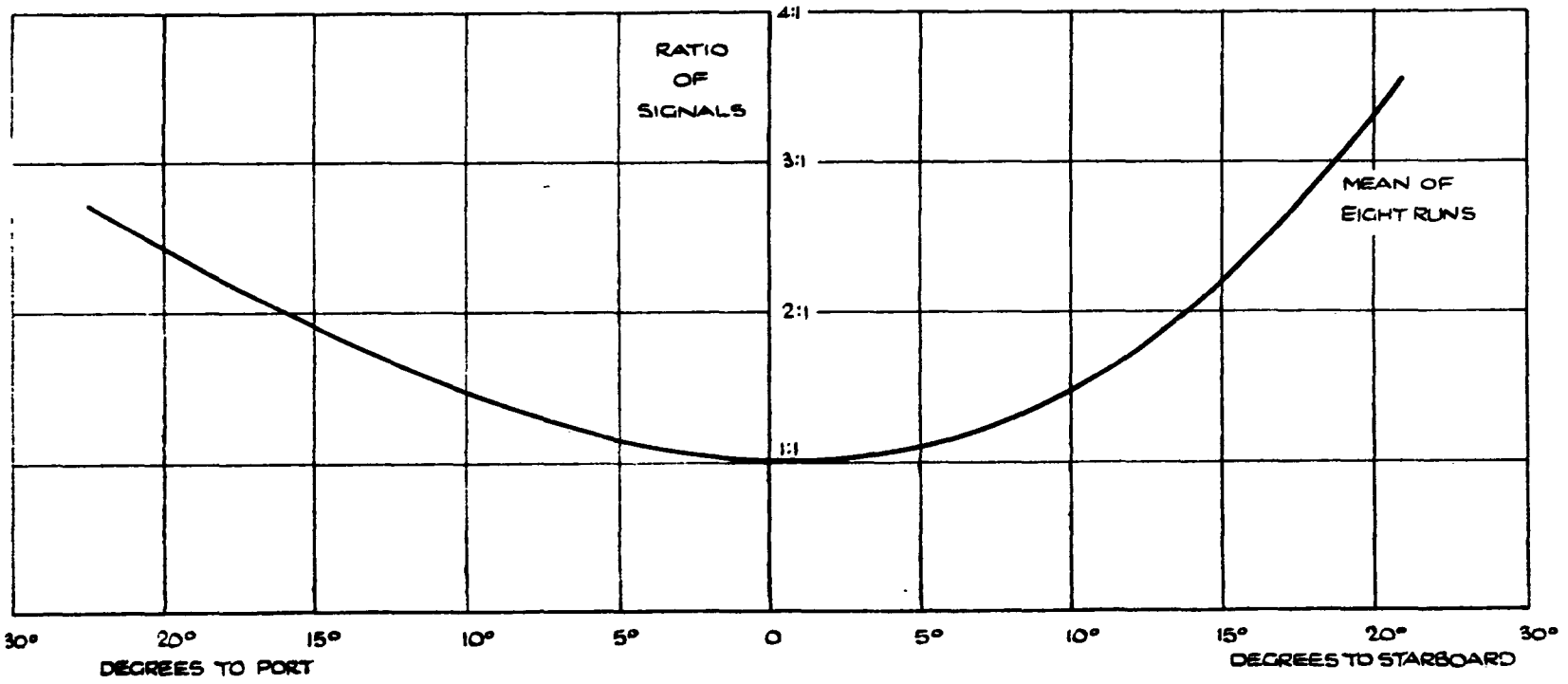


FIG. 17.

Information Centre
Knowledge Services
[dstl] Porton Down,
Salisbury
Wilts
SP4 0JQ
22060-6218
Tel: 01980-613753
Fax 01980-613970

Defense Technical Information Center (DTIC)
8725 John J. Kingman Road, Suit 0944
Fort Belvoir, VA 22060-6218
U.S.A.

AD#: AD029616

Date of Search: 30 April 2008

Record Summary: AVIA 18/4498
Title: Pembroke C Mk1 WV.699: Radio Acceptance Trials
Availability Open Document, Open Description, Normal Closure before FOI Act: 30 years
Former reference (Department) 896 Pt 8
Held by The National Archives, Kew

This document is now available at the National Archives, Kew, Surrey, United Kingdom.

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